State of California
The Resources Agency
DEPARTMENT OF FISH AND GAME

STANDING STOCKS OF FISHES IN SECTIONS OF RED CLOVER CREEK, PLUMAS COUNTY, 1991

by

Charles J. Brown
Bay-Delta and Special Water Projects Division

1992

STANDING STOCKS OF FISHES IN SECTIONS OF RED CLOVER CREEK, PLUMAS COUNTY, 1991

INTRODUCTION

Red Clover Creek (Figure 1) is the site of a proposed and authorized dam (Abbey Bridge) that would be a part of the State Water Project. It is also the site of projects designed to reduce quantities of granitic sand flowing into Indian Creek and the Feather River. Red Clover Creek is an important source of rainbow trout (Oncorhynchus mykiss) in the Indian Creek system.

An earlier study of standing stocks of fishes in Red Clover Creek established stations for long-term studies of trout populations in this watershed (Brown 1976). Four stations identified and sampled in 1976 were sampled again in 1988 (Brown 1990). Biomass of trout was much higher in 1988 than 1976.

The purpose of this study is to gather information on tributaries to Indian Creek through periodic fish sampling at established stations in Red Clover Creek which will add to our knowledge of the dynamics of that system. This knowledge will be used in evaluating the effects of proposed projects such as dam construction on the fishery resources of this system. This report documents the results of sampling conducted in 1991.

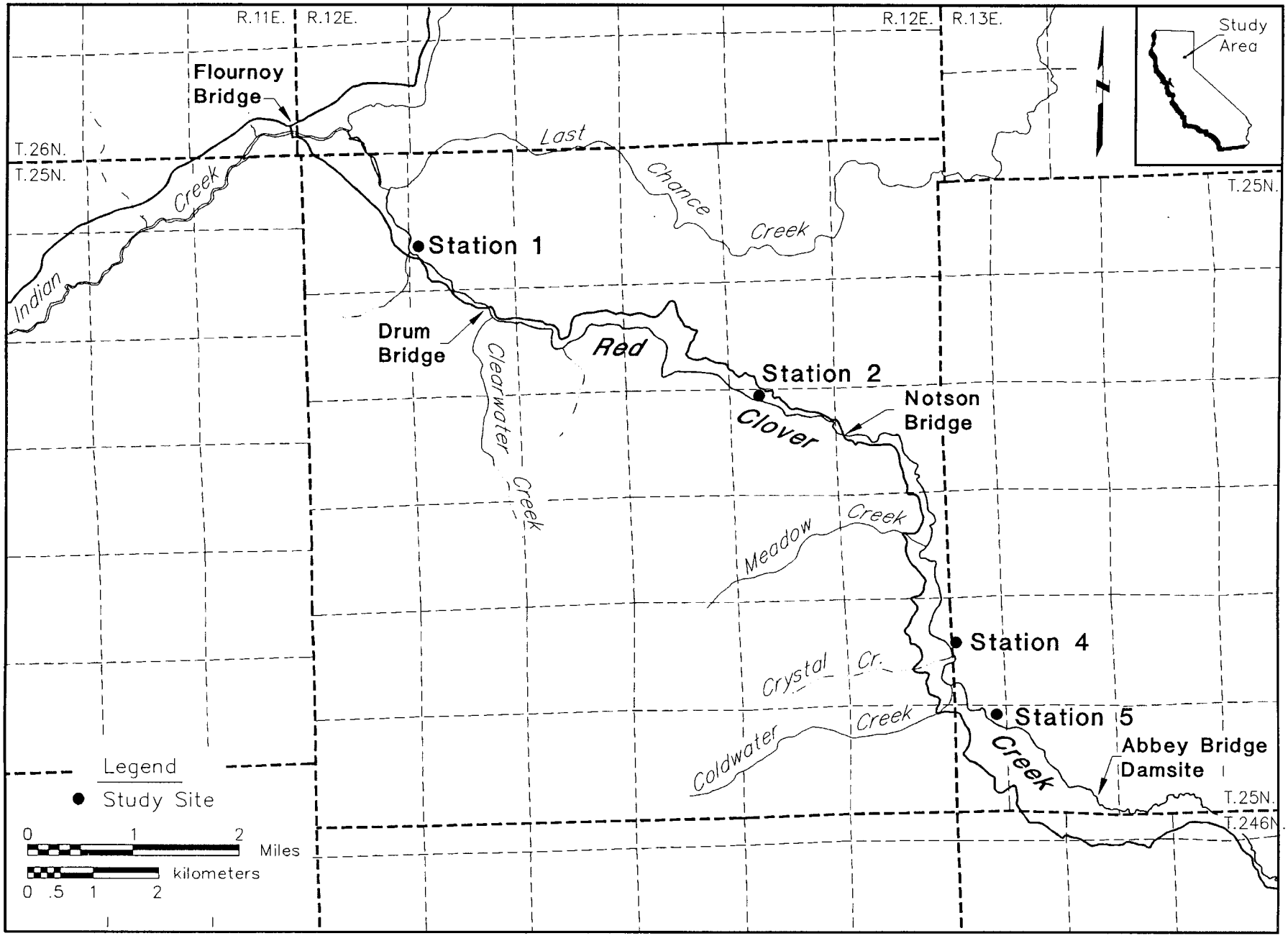

Figure 1. Stations Sampled to Estimate Standing Crop of Trout in Red Clover Creek, Plumas County, 1991.

METHODS

Standing stocks of fishes were estimated at four stations in Red Clover Creek (Figure 1) in Plumas County. The length, average width, and average depth of each station were measured (Appendix 1). Fish were captured with a battery powered backpack electroshocker in stream sections blocked by seines . Captured fish were removed from the net-enclosed section on each pass. Standing stock estimates were developed using the two-count method of Seber and LeCren (1967) or the multiple-pass method of Leslie and Davis (1939) with limits of confidence computed using a formula proposed by DeLury (1951).

The weights of rainbow trout were determined by displacement. Weights were measured for all trout caught, and fork lengths (FL) of each fish was measured to the nearest millimeter.

Scale samples were taken from trout over 100 mm in length. Scales were mounted dry between microscope slides, and their images were projected on a NCR microfiche reader at a magnification of 42X. Scale measurements for the calculation of growth were recorded to the nearest millimeter along the anterior radius of the anterior-posterior axis of the scale.

Geometric mean functional regressions were used to describe the body-scale and length-weight relationships (Ricker 1975). Estimation of true mean growth rate (G) was calculated using methods of Ricker (op. cit.).

Distribution of all fish caught is listed according to location. Standing crops of rainbow trout were calculated for individual stations where they were caught and combined for the entire creek. Age and growth, mean individual growth, and length-weight relationships were determined for rainbow trout. The coefficient of condition and 95 percent confidence intervals were also calculated.

RESULTS

Distribution

Rainbow trout were caught at stations 1,2,4 and 5. Sacramento sucker (Catostomus occidentalis) were caught only at station 2. Speckled dace (Rhinichthys osculus) were caught at stations 2, 4 and 5 (Table 1).

Table 1. Distribution of fishes in sections of Red Clover Creek, 1991.

	Station Number			
	1	2	4	5
Distance above mouth (km)	2.4	9.7	13.0	14.8
Rainbow trout	X	X	X	X
Sacramento sucker		X		
Speckled dace		X	X	X

Standing Crop

Rainbow trout were the only game fish caught in Red Clover Creek. Biomass averaged 3.0 g/m^2 at four stations. Biomass for rainbow trout large enough for fishermen to catch and keep (≥127 mm FL) averaged 2.3 g/m^2 (Table 2).

Table 2. Estimates of rainbow trout standing crop in Red Clover Creek, Plumas County, 1991.

Distance above mouth (km)	Population Estimate	95% Confidence Interval	Biomass (g/m^2)	Estimate of Catchable Trout (≥127 mm FL)	Biomass of Catchable Trout (g/m^2)
2.4	58	50-72	6.9	16	4.7
9.7	22	21-26	4.9	16	4.5
13.0	25	24-29	0.1	0	0
14.8	7	7-8	0.1	0	0

Sacramento sucker and speckled dace were the only non-salmonid fish caught in Red Clover Creek. Biomass averages were not calculated for these species, because the weights were not recorded (Table 4).

Table 4. Population estimates of nongame fishes in Red Clover Creek, Plumas County, 1991.

Distance above mouth (km)	Species	Population Estimate	95% Confidence Interval
9.7	Sacramento sucker	174	94-300
9.7	Speckled dace	38	33-49
13.0	Speckled dace	120	40-426
14.8	Speckled dace	97	48-215

Age and Growth

The formula $L = 6.5 + 5.0\ S$ describes the relationship between the fork length (L) and enlarged scale radius (S) of 39 rainbow trout. The coefficient of correlation (r^2) is 0.80.

Population growth rate slightly was faster than mean individual growth in age 1+ fish (Table 5).

Table 5. Growth rates for rainbow trout caught in Red Clover Creek, Plumas County, 1991.

	Population Growth			Mean Individual Growth		
Age Interval	Length Interval (mm)	Difference of Natural Logarithms	Instantaneous Growth Rate Gx	Length Interval (mm)	Difference of Natural Logarithms	Instantaneous Growth Rate Gx
1-2	97-166	0.537	1.6	98-166	0.527	1.5

Age 1+ rainbow trout averaged 153 mm in fork length; age 2+ fish averaged 206 mm (Table 6).

Table 6. Calculated fork length of rainbow trout from Red Clover Creek, Plumas County, 1991.

Age	No. of Fish	Length at Capture (mm)	Calculated Lengths at Successive Annuli 1	2
1	32	153	97	-
2	7	206	98	166
Number of back-calculations			39	7
Weighted means (mm)			97	166
Increments (mm)			97	69

Length and Weight

Age group 0+ rainbow trout represented 5% of the catch. Age group 1+ trout comprised 86% of the total, and age 2+ fish made up the remaining 9% of the catch (Figure 2) (Appendix 2).

The relationship between length (L) and weight (W) of rainbow trout is:

$Log_{10}W = -4.7 + 2.9\ Log_{10}L$

$r^2 = 0.98$

N = 102 (Figure 3) (Appendix 3)

Coefficient of Condition

We calculated the coefficient of condition and 95% confidence limits for a total of 102 rainbow trout (Table 7). There is no significant difference between the coefficient of condition for any age group of rainbow trout we tested ("t" test, 0.05 level).

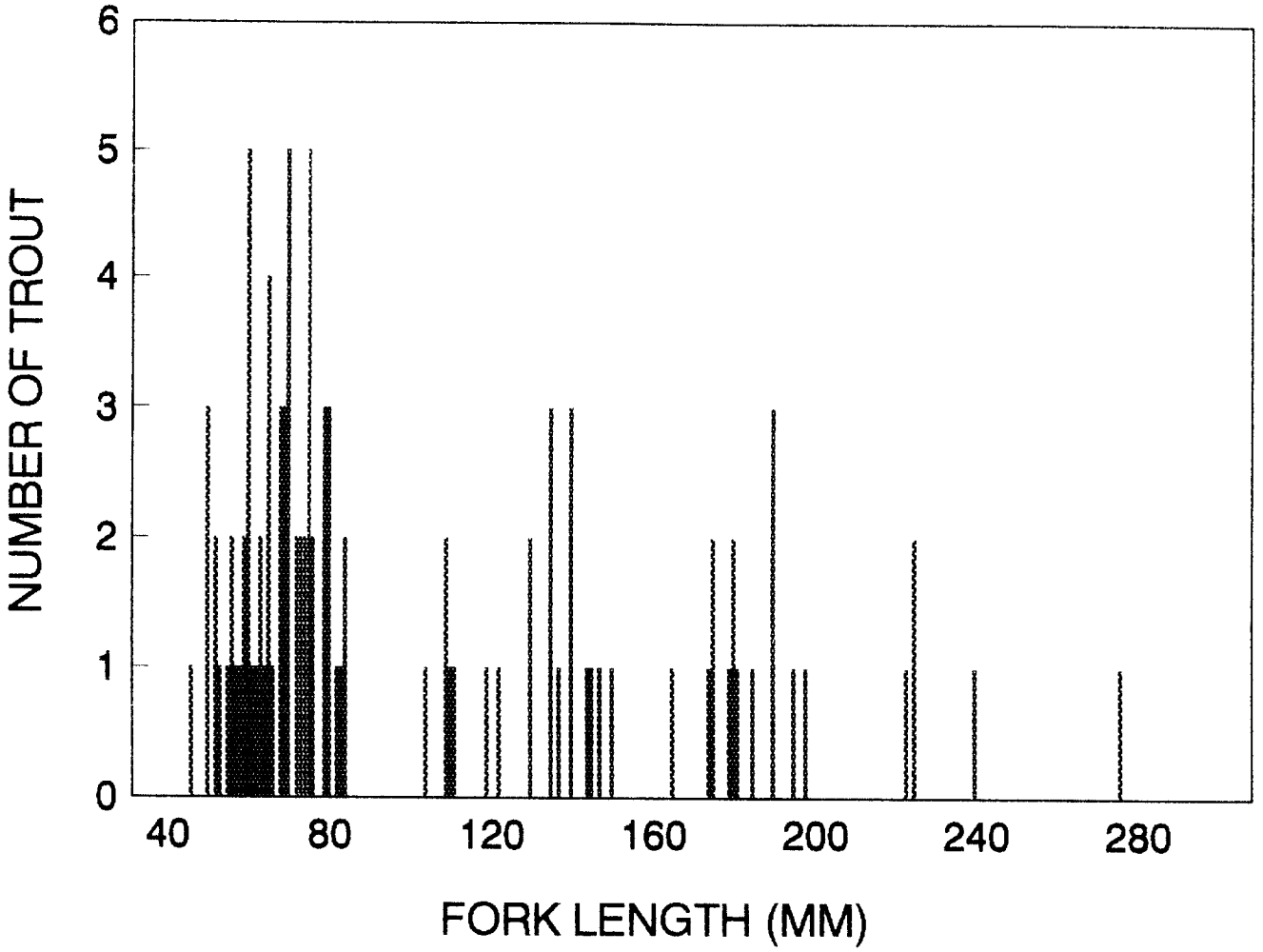

FIGURE 2. Length, observed frequency, and age of rainbow trout caught in Red Clover Creek, Plumas County, 1991.

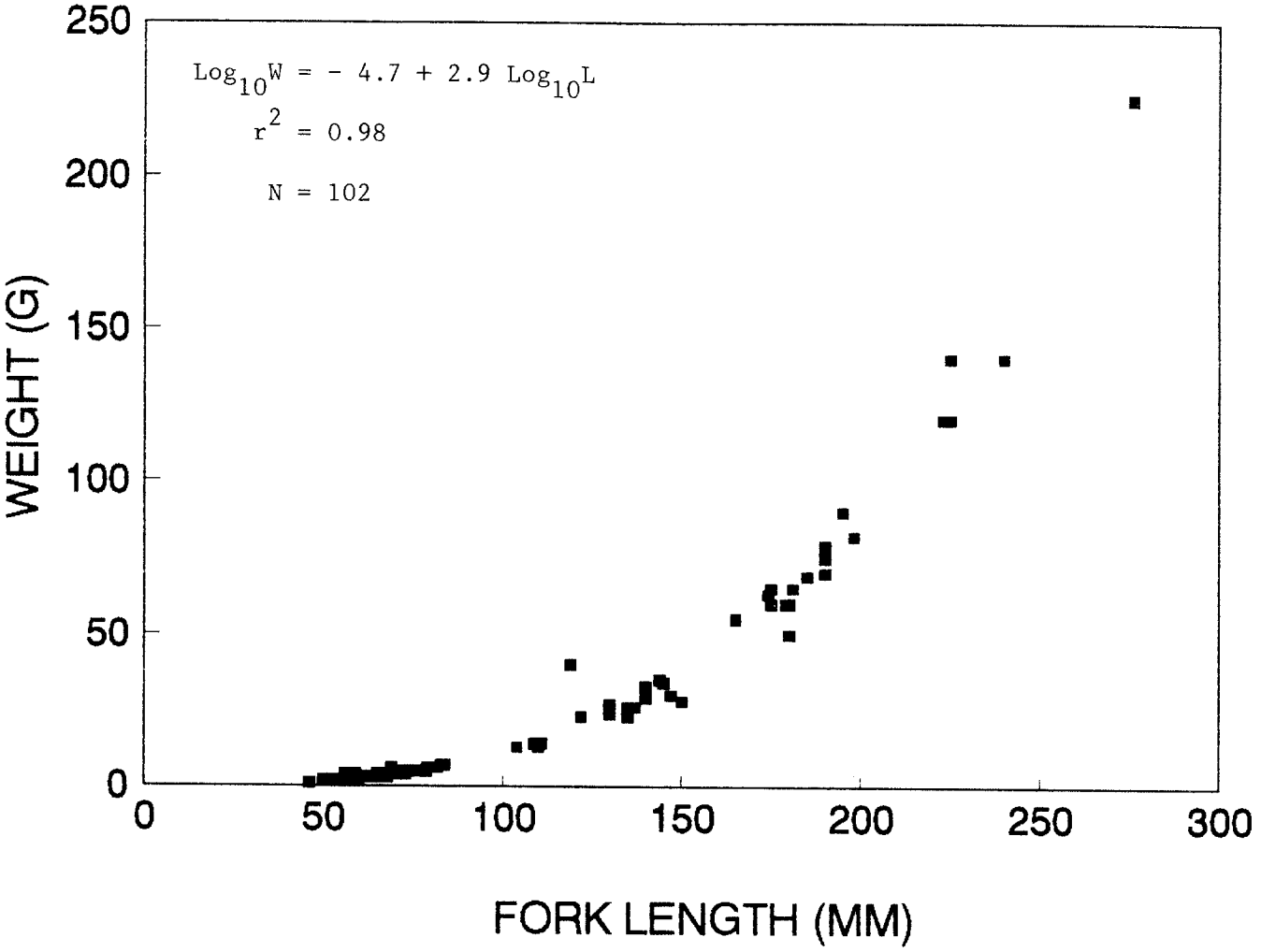

FIGURE 3. The relationship between length and weight of rainbow trout caught in sections of Red Clover Creek, Plumas County, 1991.

Table 7. Coefficient of condition and age of rainbow trout in Red Clover Creek, Plumas County, 1991.

Age Group	Number of Fish	Coefficient of Condition	95% Confidence Interval
0+	64	1.2459	0.7921-1.6996
1+	24	1.1456	0.6038-1.6875
2+	14	1.1016	0.8652-1.3381
Combined	102	1.2011	0.7370-1.6676

LITERATURE CITED

Brown, C. J. 1976. Standing stocks of fishes in sections of Red Clover, Little Last Chance, Big Grizzly, Last Chance, and Squaw Queen Creeks, Plumas County, 1976. Calif. Dept. of Fish and Game, 8 p.

-----. 1990. Results of sampling fish in sections of Red Clover Creek, Plumas County, 1988. Calif. Dept. of Fish and Game, 23 p.

DeLury, D.B. 1951. On the planning of experiments for the estimation of fish populations. J. Fish. Res. Bd. Canada. 8:281-307.

Leslie, P. H., and D.H.S. Davis. 1939. An attempt to determine the absolute number of rats in a given area. J. Animal Ecology. 8:94-113.

Ricker, W. E. 1975. Computation and interpretation of biological statistics of fish populations. Fish. Res. Bd. Canada. Bull. 191, 382 pp.

Seber, G.A.F., and E.D. LeCren. 1967. Estimating population parameters from catches large relative to the population. J. Animal Ecology. 36(3): 631-643.

APPENDIX 1

FISH POPULATION STATIONS FOR RED CLOVER CREEK, 1991

Station 1 - Located 2.4 stream km upstream from the confluence with Indian Creek. Drive up Genesee-Beckwourth Road (26N16) 2.7 km above Flournoy Bridge to a small, dry watercourse. Hike downhill about 46 m. to Red Clover Creek, near the site of the abandoned DWR Red Clover near Genesee stream gage (SE 1/4 of SW 1/4, Section 5, T2N, R12E). This station is labeled RC-3 in DFG Region 2 files. The station is comprised primarily of large boulders and is mostly a deep run (95%), with some pool area (5%). It is 30.5 m long, with average width of 5.3 m, and average depth of 0.47 m, giving it a surface area of 161.7 m^2 and a volume of 76 m^3.

Station 2 - Located 9.7 stream km upstream from the confluence with Indian Creek. Drive up Genesee-Beckwourth Road about 11.3 km to the campsite at the top of the canyon. Hike down to the stream adjacent to the campsite (SW 1/4, NE 1/4, Section 14, T25N, R12E). This station has many large boulders, but also has some gravel and sand bottom areas. It is mostly pool area (66%), with some run (19%) and riffle (15%). Its length is 64.9 m, with an average width of 4.7 m, and an average depth of 0.3 m, giving it a surface area of 305 m^2 and a volume of 82.4 m^3.

Station 4 - Located 13.0 stream km upstream from the confluence with Indian Creek. Drive up to the Genesee-Beckwourth Road about 16.1 km above Flournoy Bridge and turn left on a spur road. Drive 0.3 km down the spur road. The station is located just upstream of a dry tributary and downstream from a live tributary (SE 1/4, NE 1/4, Section 24, T25N, R12E). The substrate is mostly volcanic with a small amount of sand and gravel. The station is broken up by bedrock outcroppings and is primarily pool (74%) and riffle (23%) with a small amount of run (3%). The station is 82 m long, with an average width of 7.3 m, and an average depth of 0.3 m, giving it a surface area of 598.6 m^2 and a volume of 149.7 m^3.

Station 5 - Located 14.8 stream km upstream from the confluence with Indian Creek. Drive up to the Genesee-Beckwourth Road about 18.1 km above Flournoy Bridge and turn left on a spur road. Drive about 0.6 km down the spur road. The station is located just downstrean from a live tributary (SE 1/4, NE1/4, Section 31, T25N, R13E). The substrate is mostly sand, with some gravel area. The station is primarily pool (50%), with a smaller component of run (30%) and pool (20%). It is 83.2 m long, with an average width of 7.8 m and an average depth of 0.22 m, giving it a surface area of 649 m^2 and a volume of 142.8m^3.

APPENDIX 2

LENGTH AND NUMBER OF
RAINBOW TROUT CAUGHT IN
RED CLOVER CREEK, 1991

Fork Length (mm)	Number of Fish	Fork Length (mm)	Number of Fish
46	1	109	2
50	3	110	1
52	2	111	1
53	1	119	1
55	1	122	1
56	2	130	2
57	1	135	3
58	1	137	1
59	2	140	3
60	5	144	1
61	1	145	1
62	1	147	1
63	2	150	1
64	1	165	1
65	4	174	1
66	1	175	2
68	3	179	1
69	3	180	2
70	5	181	1
72	2	185	1
73	2	190	3
74	2	195	1
75	5	198	1
76	2	223	1
79	3	225	2
80	3	240	1
82	1	276	1
83	1		
84	2		
104	1		

APPENDIX 3

LENGTH AND WEIGHT OF RAINBOW TROUT CAUGHT IN RED CLOVER CREEK, 1991

Fork Length (mm)	Weight (g)	Fork Length (mm)	Weight (g)
46	1	73	4
50	2	73	5
50	2	74	5
50	2	74	5
52	2	75	5
52	2	75	5
53	2	75	5
55	2	75	5
56	4	75	5
56	2	76	5
57	2	76	5
58	2	79	5
59	3	79	5
59	4	79	6
60	3	80	6
60	2	80	6
60	2	80	6
60	3	82	6
60	3	83	7
61	3	84	7
62	3	84	7
63	3	104	13
63	3	109	14
64	3	109	14
65	3	110	13
65	3	111	14
65	3	119	40
65	4	122	23
66	3	130	24
68	4	130	27
68	4	135	23
68	3	135	26
69	4	135	30
69	4	137	26
69	6	140	29
70	4	140	30
70	4	140	33
70	4	144	35
70	4	145	34
70	4	147	30
72	4	150	28
72	5	165	55
		174	63
		175	60

APPENDIX 3
(con't)

Fork Length (mm)	Weight (g)
175	65
179	60
180	50
180	60
181	65
185	69
190	70
190	75
190	79
195	90
198	82
223	120
225	120
225	140
240	140
276	225